

ABSTRACT

Vegetable have recently been implicated in outbreaks of foodborne diseases. These outbreaks have led to increased scrutiny of vegetable processing and sanitation. The purpose of this study was to determine the fate of *Escherichia coli* O157 on washed and unwashed spinach leaves. Unwashed and washed (100 ppm sodium hypochlorite for one minute) samples were inoculated with a non-toxicogenic strain of *E. coli* O157. The samples were dried for one hour. The total plate count (TPC) and *E. coli* O157 counts were taken immediately after drying and on days 3, 5, 7, 9, and 11 while stored at 4°C. The same counts were taken on days 1, 2, and 3 for samples stored at room temperature. At room temperature, differences between washed and unwashed spinach leaves were not observed. The TPC from washed and unwashed samples was similar at both temperatures. The *E. coli* O157 counts on both washed and unwashed leaves decreased, but there was a greater decrease on the unwashed spinach leaves ($P=0.007$). Although the TPC counts were similar on both washed and unwashed leaves, it is possible that the microbial communities differed on washed and unwashed leaves or the TPC did not microorganisms that would affect the survival and proliferation of *E. coli* O157. Enteric pathogens that contaminate vegetables after sanitation at a processing facility could negatively affect produce safety possibly due to changes in the microbial community dynamics on leaf surfaces.

INTRODUCTION

•In the past 10 years, there have been several reports of foodborne disease associated with fresh and minimally processed produce. In an attempt to create safer produce, changes in the current processing of fruits and vegetables need to be assessed.

•Chlorinate wash water is commonly applied to reduce pathogens on the surface of fruits and vegetables and keep the wash water clean (Beuchat, 1999).

•However, there is evidence that some bacteria contaminate or proliferate after washing and during further processing and transport. Johnston and others (2005) found greater than a 1-log increase in bacterial count from harvest to boxed samples on various vegetables.

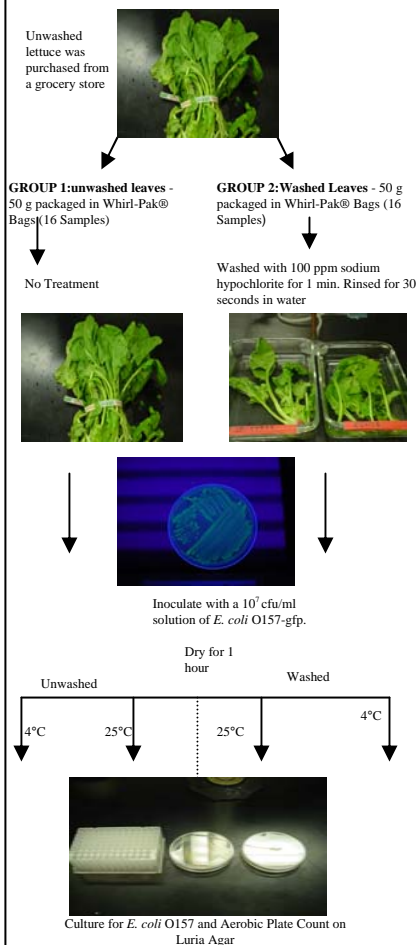
•It is possible that post-sanitation contamination with foodborne pathogens can cause a major impact in the proliferation of foodborne pathogens due to the absence of potential competitors.

•Objectives:

- Determine the effect of sanitation on the proliferation of *E. coli* O157 and plant microflora
- Determine the effect of temperature on *E. coli* O157 and plant microflora

•We hypothesize that spinach leaves washed with bleach solution will be more conducive to *E. coli* O157 survival, at both room and refrigeration temperatures, than unwashed product.

MATERIALS and METHODS



RESULTS and DISCUSSION

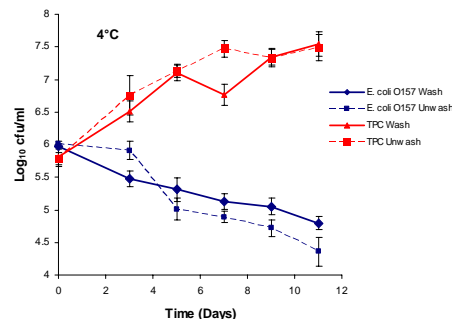


Figure 1 – Total plate count and *E. coli* O157 count over time for spinach leaves stored at 4°C. Differences in *E. coli* O157 counts for the unwashed and washed leaves was observed over an 11-day period ($P = 0.007$)

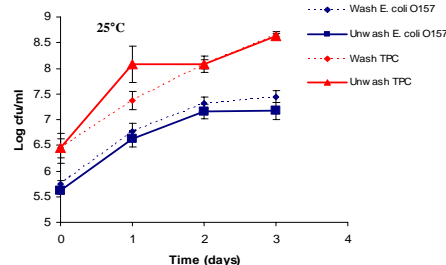


Figure 2 – Total plate count and *E. coli* O157 count for washed and unwashed spinach leaves stored at 25°C. No differences in TPC or *E. coli* O157 counts were observed over three days ($P > 0.05$)

DISCUSSION:

Natural inhabitants of vegetables act as antagonists of *E. coli* O157 and other foodborne pathogens (Liao and Fett, 2001). Washing might remove some of these natural competitors that could enhance the survival and proliferation of *E. coli* O157. Because the effect was greatest at refrigeration temperature, it is possible that these natural competitors compete against *E. coli* O157 and the remaining flora better at low temperatures.

CONCLUSION

At refrigeration temperature, *E. coli* O157 decreased significantly over the 11-days of the study, but there was a greater decrease on unwashed leaves. At room temperature, *E. coli* O157 increased in both over three days, but there were not any differences between the two treatments. There were no differences in the total plate count at either temperature indicating that the presence of *E. coli* O157 did not affect the proliferation of the culturable microbial community. It is possible that the dynamics of the microbial community was different on washed and unwashed leaves or that many members of the community did not grow in this assay.

FUTURE CONSIDERATIONS

- Study the community dynamics of the washed and unwashed leaves to determine if there are differences in the communities that could affect the proliferation of *E. coli* O157 and other foodborne pathogens
- Identify natural competitors of foodborne pathogens on fruits and vegetables and determine if they are affected sanitation and processing
- Study the effects of packaging and modified atmospheric packaging on the survival and proliferation of human pathogens and the flora of produce

REFERENCES

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